{In Archive} Powerpoint presentation from Kingsville Dome citizens (2nd day of trip on August 5th)

Stacey Dwyer to: Philip Dellinger, Ray Leissner, Jose Torres 08/08/2011 11:25 AM

Cc: Miguel Flores, William Honker

From: Stacey Dwyer/R6/USEPA/US

To: Philip Dellinger/R6/USEPA/US@EPA, Ray Leissner/R6/USEPA/US@EPA, Jose Torres/R6/USEPA/US@EPA

Cc: Miguel Flores/R6/USEPA/US@EPA, William Honker/R6/USEPA/US@EPA

History: This message has been replied to.

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Here is the power point by Richard J. Abitz, PhD, Principal Geochemist and Owner of Geochemical Consulting Services, LLC. He is the technical consultant for the citizens of Garcia hill in Kingsville, Texas.

kingsvillecitizenpresentation5august2011.ppt

Stacey

00776.pdf

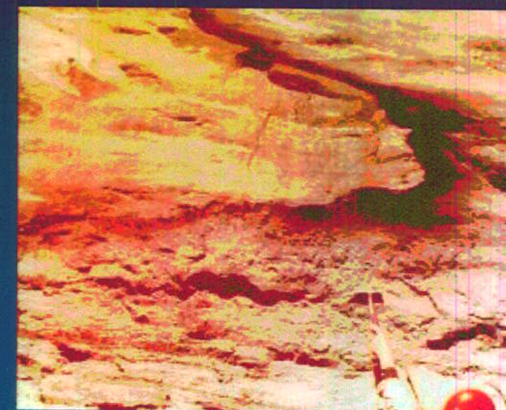
Pre- and Post-Mining Water Quality at ISL sites: Emphasis on Kingsville Dome

Richard J. Abitz, PhD
Geochemical Consulting Services

August 5, 2011
EPA Region VI meeting with STOP, Victoria, TX

Overview of Discussion Topics

Natural uranium and radium background levels in groundwater contacting uranium ore



Valid background water quality in proposed aquifer exemption zone

Excursions and upper control limits (UCLs)

Restoration values and timeframes

Long-term monitoring to assess plume migration and protect human health and the environment

Natural Background Levels

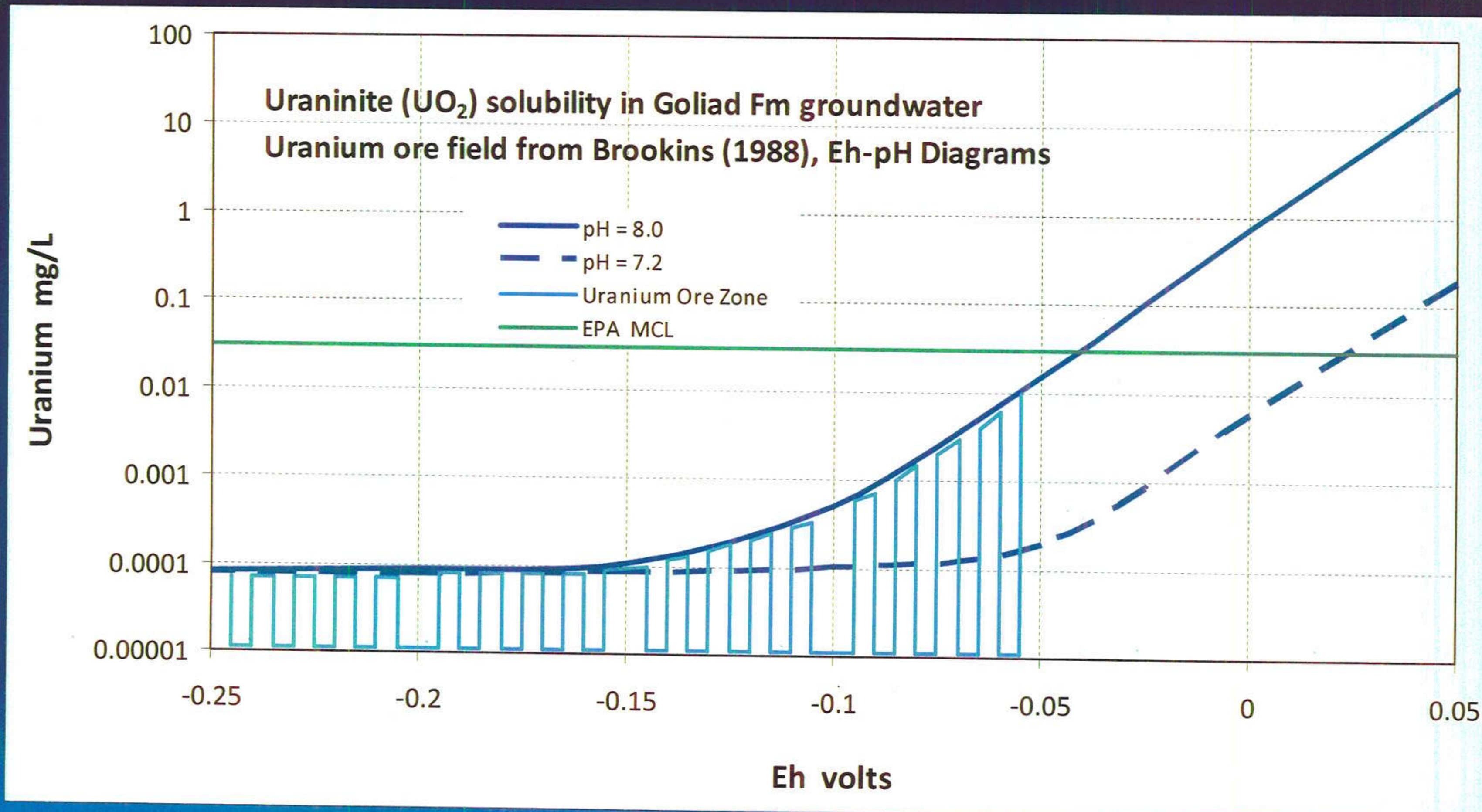
Difficult to measure due to reducing conditions in ore zones and exploratory drilling

Drilling disturbs ore zone…may introduce oxygen

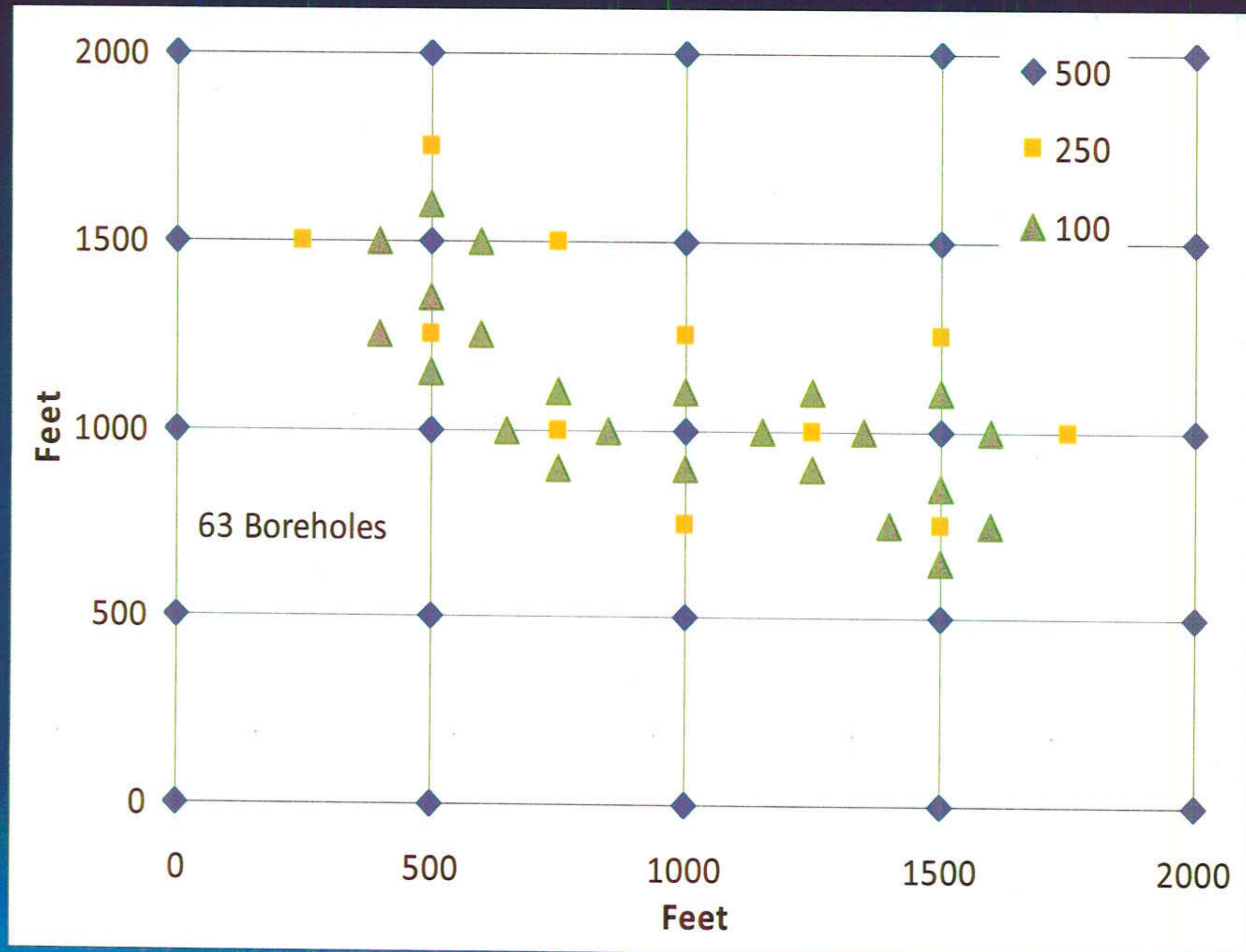
Unknown if 'natural' background ever determined for uranium ore bodies

Possible to achieve with proper scientific approach (e.g., geoprobe methods and reducing drilling fluids during exploration)

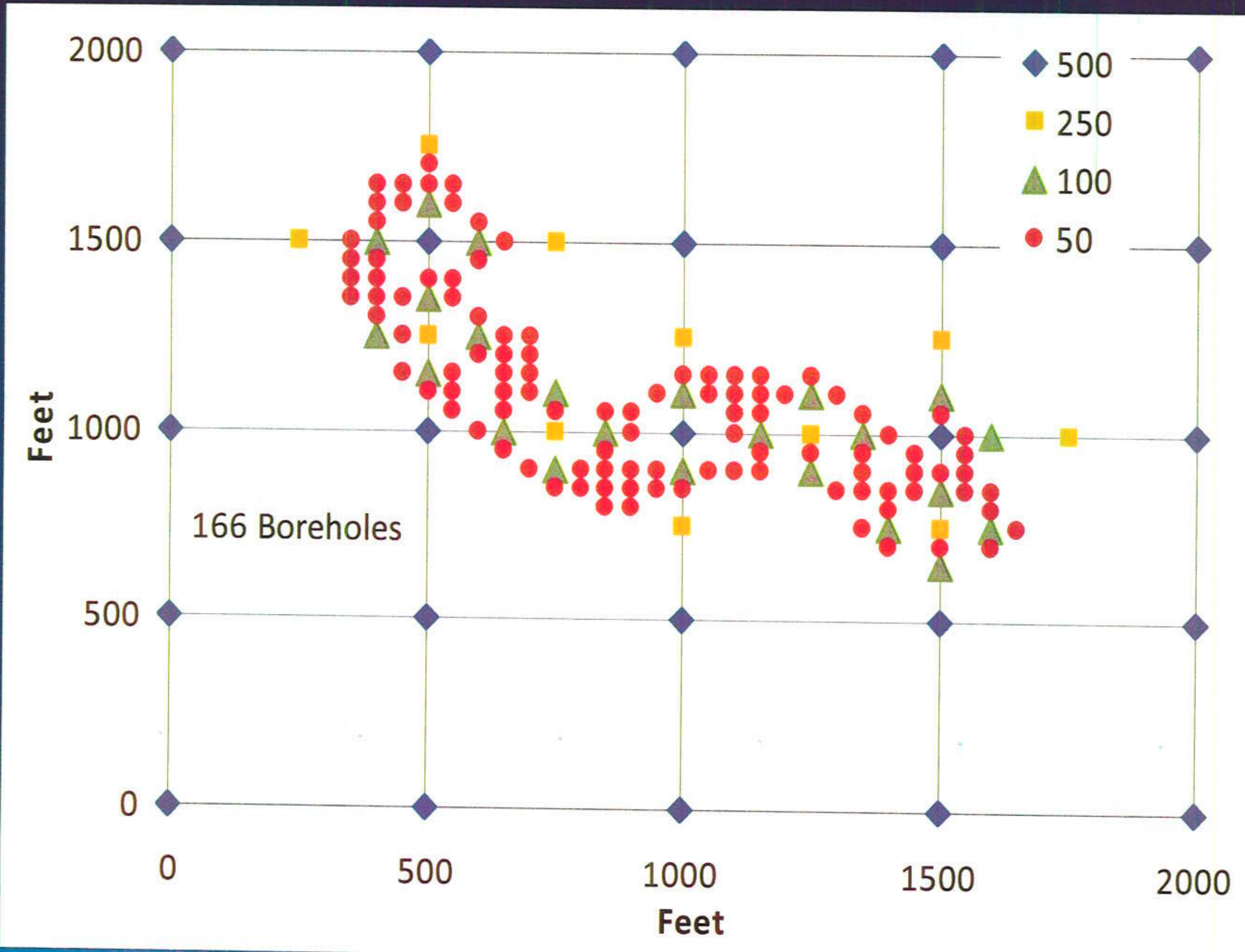
Uranium Levels in Undisturbed Ore Horizons



Exploration Boreholes – Early Phase

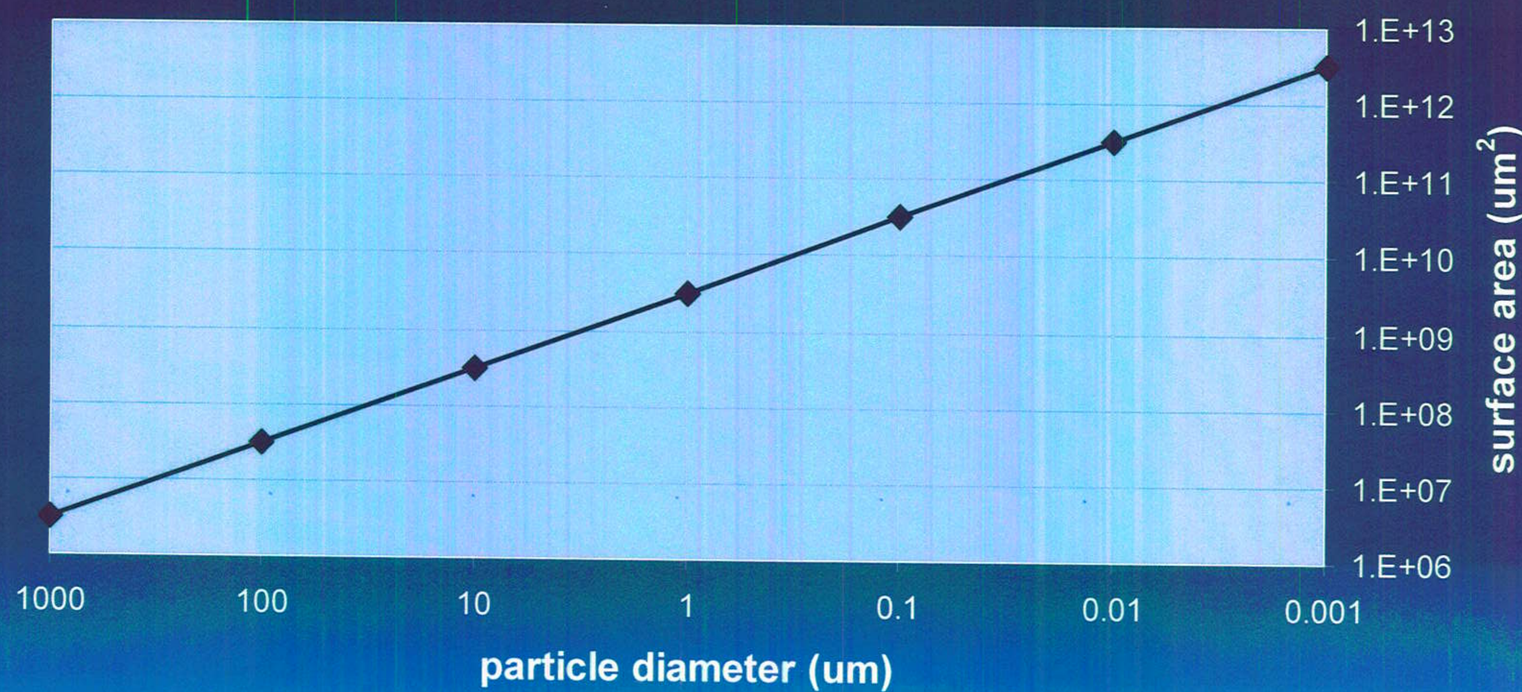


Exploration Boreholes – Late Phase



Drilling Issues Related to Redox Disequilibrium

Physical change to the ore minerals



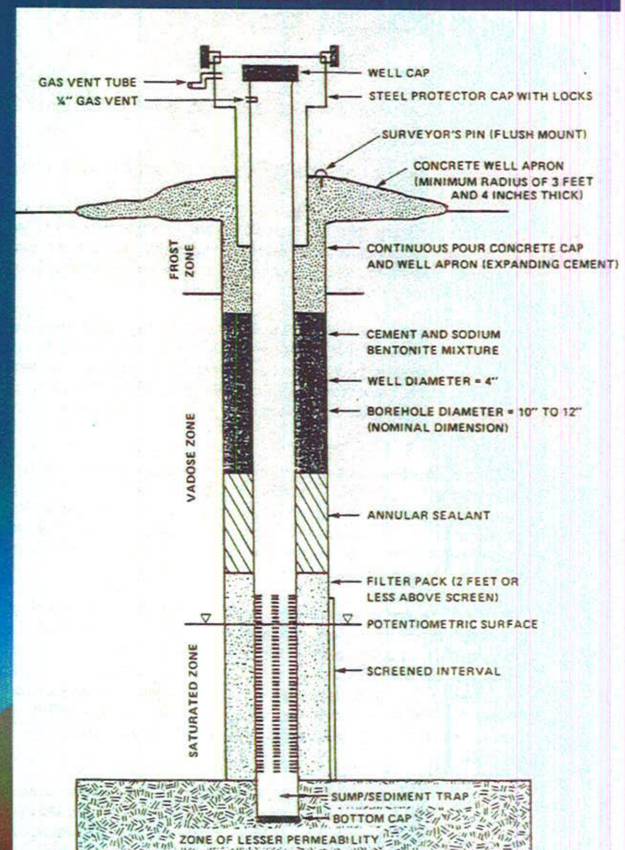
Drilling Issues Related to Redox Disequilibrium

Chemical reactions in the ore zone

$^{7}/_{2}O_2 + H_2O + FeS_2 \rightarrow 2H^+ + Fe^{++} + 2SO_4^{--}$

$\frac{1}{2}O_2 + 2H^+ + UO_2 \rightarrow H_2O + UO_2^{++}$

Airlift purge and pump adds O_2



Mineral Dissolution Rates

General form of rate law (Lasaga, 1995)[1]:

$$Rate = k_0 * A_{min} * e^{-Ea/RT} * a^n_{H+} * g(I) * \Pi_i a^n_i * f(\Delta G_r)$$

Increase in both surface area (A_{min}) and O_2 activity (a^n_{O2}) will increase dissolution rate.

1 Lasaga, A.C., 1995, Fundamental Approaches in Describing Mineral Dissolution and Precipitation Reactions, *in* Reviews in Mineralogy, Volume 31, Chemical Weathering Rates of Silicate Minerals, Mineralogical Society of America.

Median Values for Ore Zone Wells

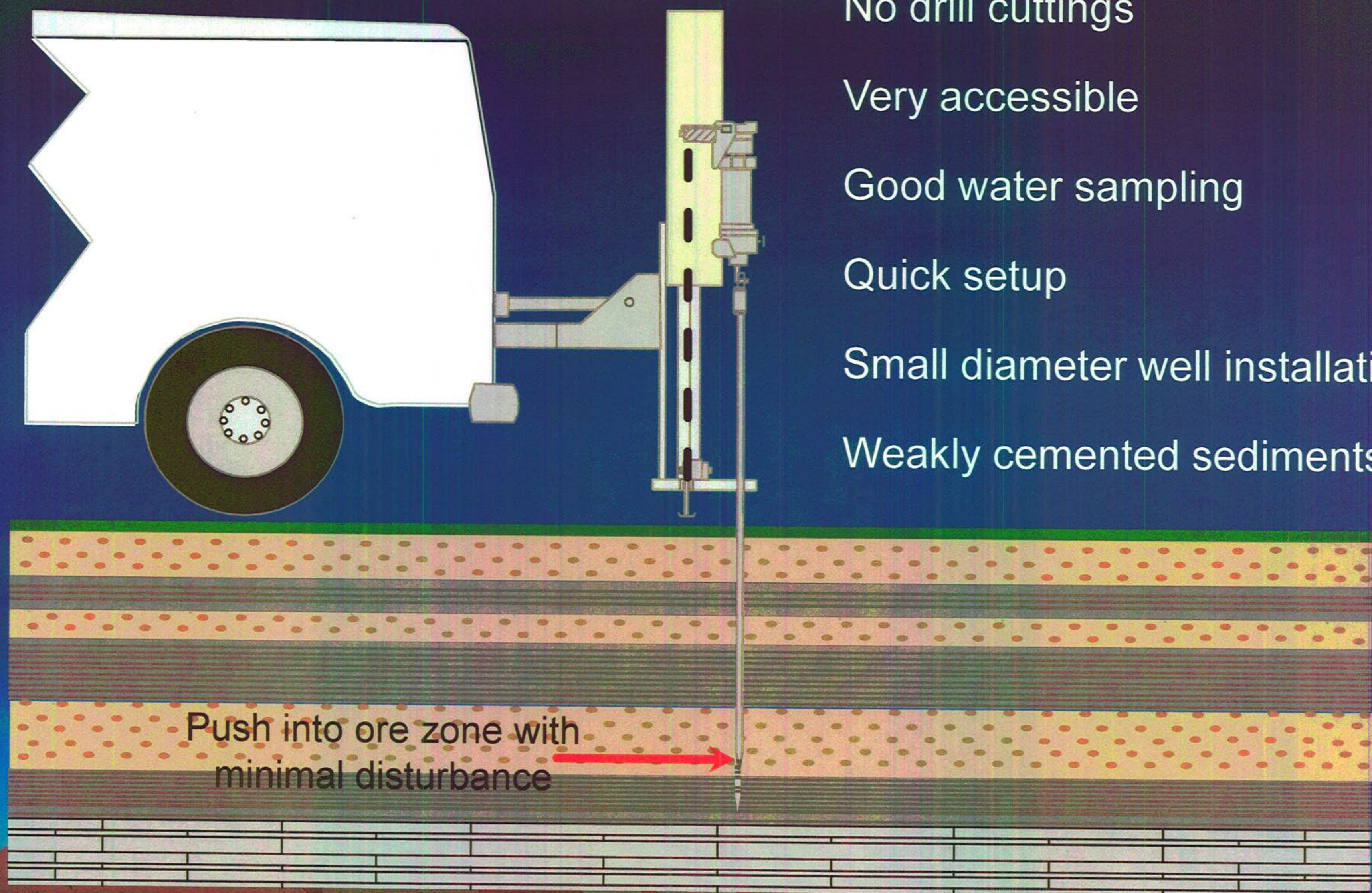
Site	Uranium (mg/L)	Radium-226 (pCi/L)
HRI Crownpoint, NM	0.010	0.09
Mobile Pilot Plant, NM	0.011	1.6
Strata Energy Ross, WY	0.031	3.2

Hydro Resources, Inc., 1993a. Section 9 Pilot Summary Report. Prepared by HRI, Inc., Dallas, Texas, March 12. NB 6.2, ACN 9304130415.

Hydro Resources, Inc., 1993b. Church Rock Project Revised Environmental Report, March 16. NB 6.1, ACN 9304130421.

Strata Energy, 2010, Ross ISR Project USNRC License Application Crook County, Wyoming.

Geoprobe Method



- No drill cuttings
- Very accessible
- Good water sampling
- Quick setup
- Small diameter well installation
- Weakly cemented sediments

Valid Background Water Quality

Representative samples from proposed aquifer exemption zone (early exploration phase)

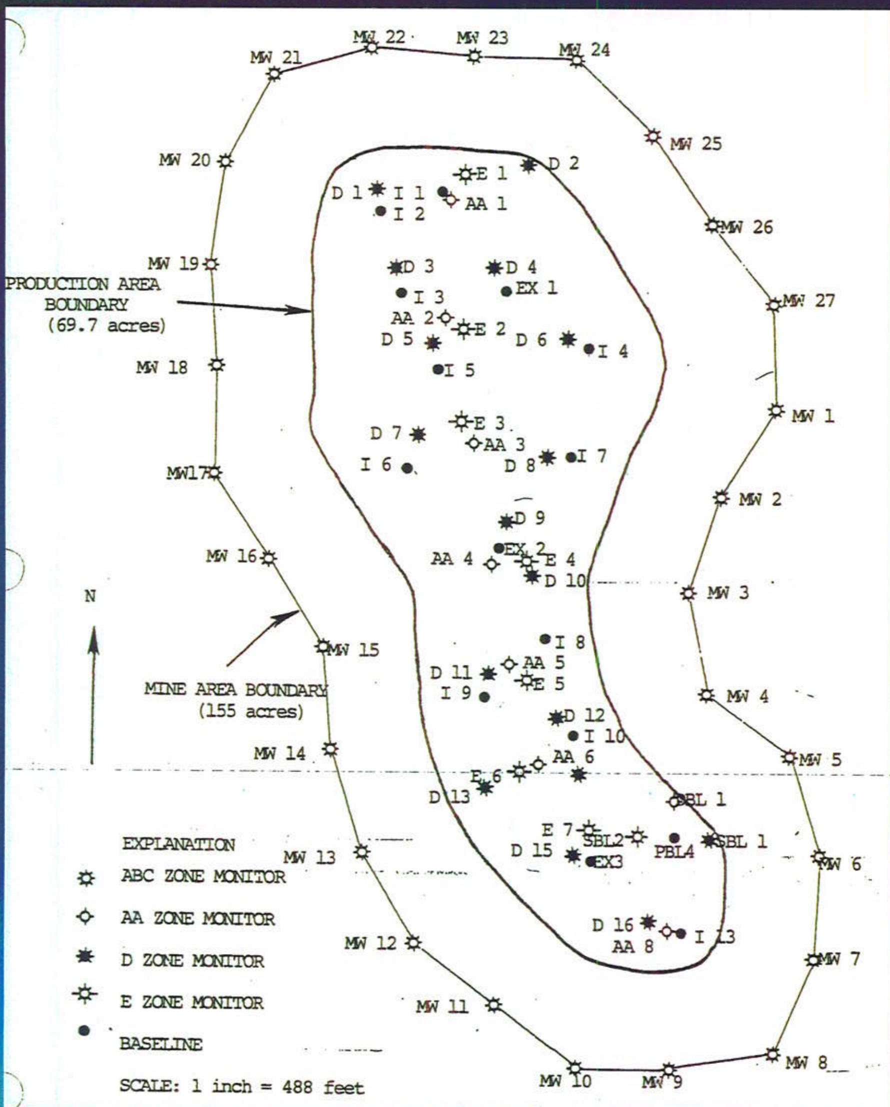
Appropriate drilling (reducing fluids), well development (low turbidity) and sampling methods

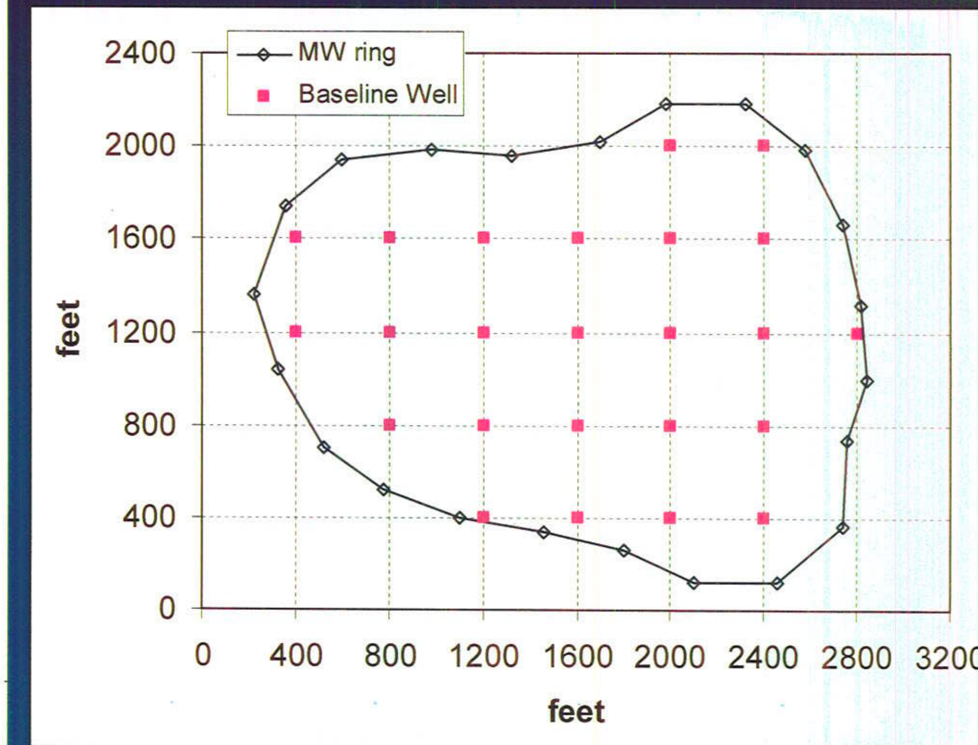
Minimum of 4 quarterly sample rounds

Robust QA for field & lab dups; data validation

Valid statistical methods for data manipulation used to derive background values

Representative Groundwater Samples





Representative Groundwater Samples

KING# 1E+05 STATE OF TEXAS WELL REPORT Date Entered: 8/1/2007

OWNER: Uranium Energy Corp. OWNER ADDRESS: 9801 Anderson Mill Rd.,Ste.230 Austin , TX 75650

ADDRESS OF WELL'S LOCATION: ,TX

COUNTY: Goliad LATITUDE 285213 LONGITUDE: 972136

Owner's Well Number RBLD-2 ELEVATION:

TYPE OF WORK

- [ ] New Well
- [ ] Replacement Well
- [x] Deepening
- [ ] Reconditioning

PROPOSED USE:

- [x] Monitor Well
- [ ] Env. Soi
- [ ] Industrial
- [ ] Irrigation
- [ ] Injection
- [ ] Public Supply
- [ ] De-watering
- [ ] Rig Su

- [ ] Surface Sleeve Installed
- [ ] Alternative Procedure Used

Approved by Variance No

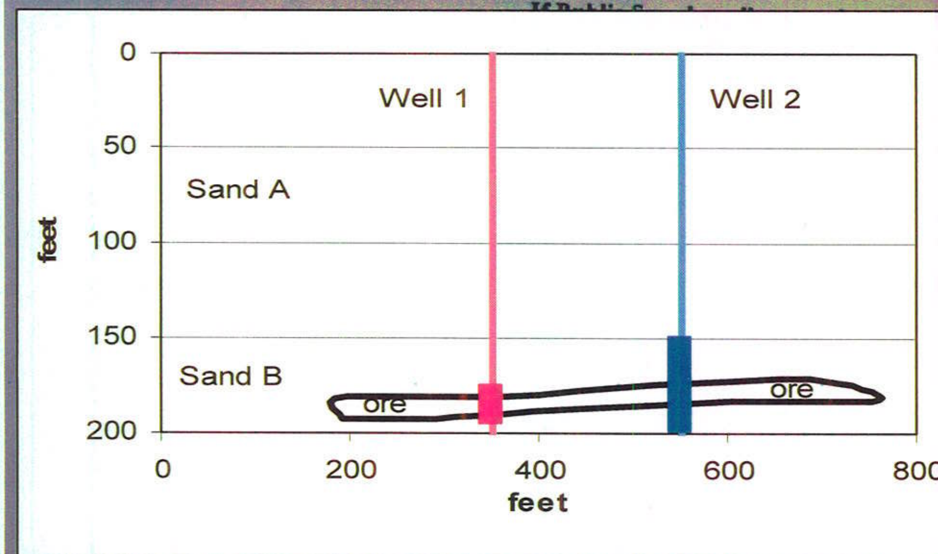
DESCRIPTION AND COLOR OF FORMATION MATERIA

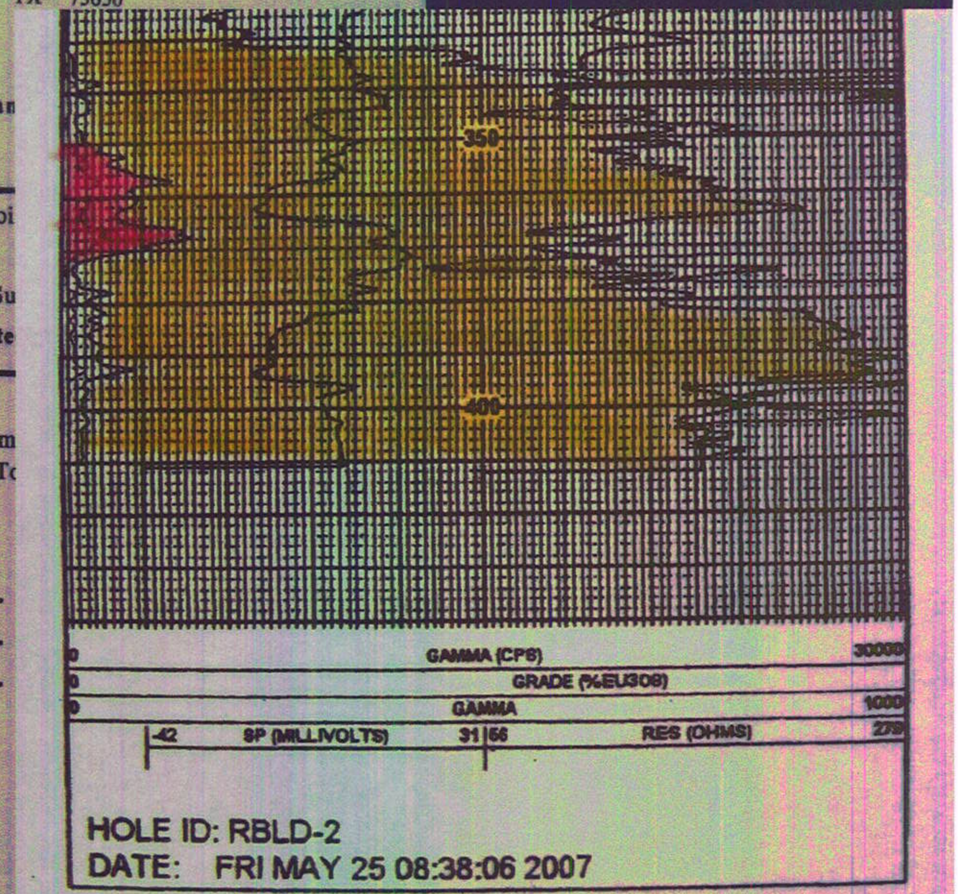
From (ft.) To (ft.) Descriptio

355-375 sand

CASING, BLANK PIPE, AND WELL SCREEN DATA

Dia.	New/Used	Type	Setting From/To	Gage
3	N	PVC screen	355-375	0.01





Improper Drilling and Development Methods

Chemical reactions in the ore zone

$^{7}/_{2}O_2 + H_2O + FeS_2 \rightarrow 2H^+ + Fe^{++} + 2SO_4^{--}$

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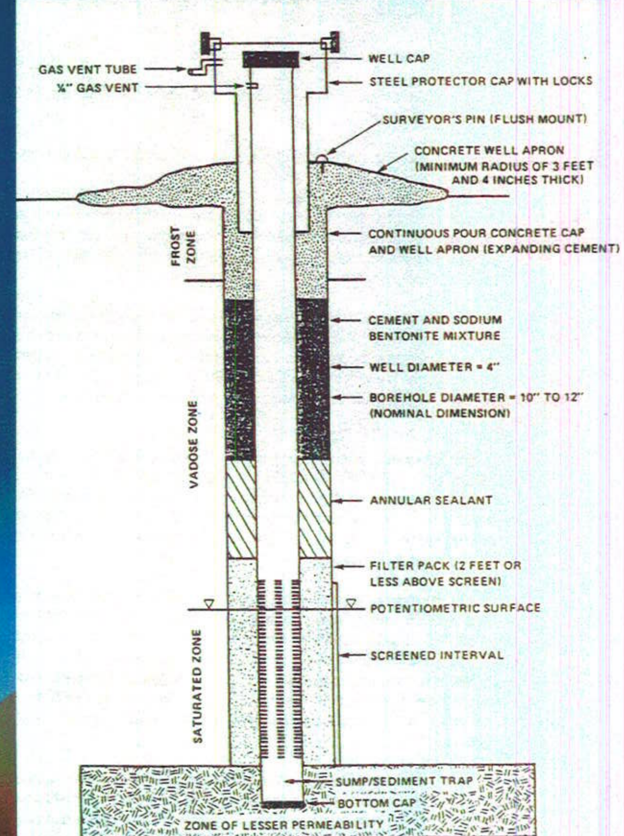
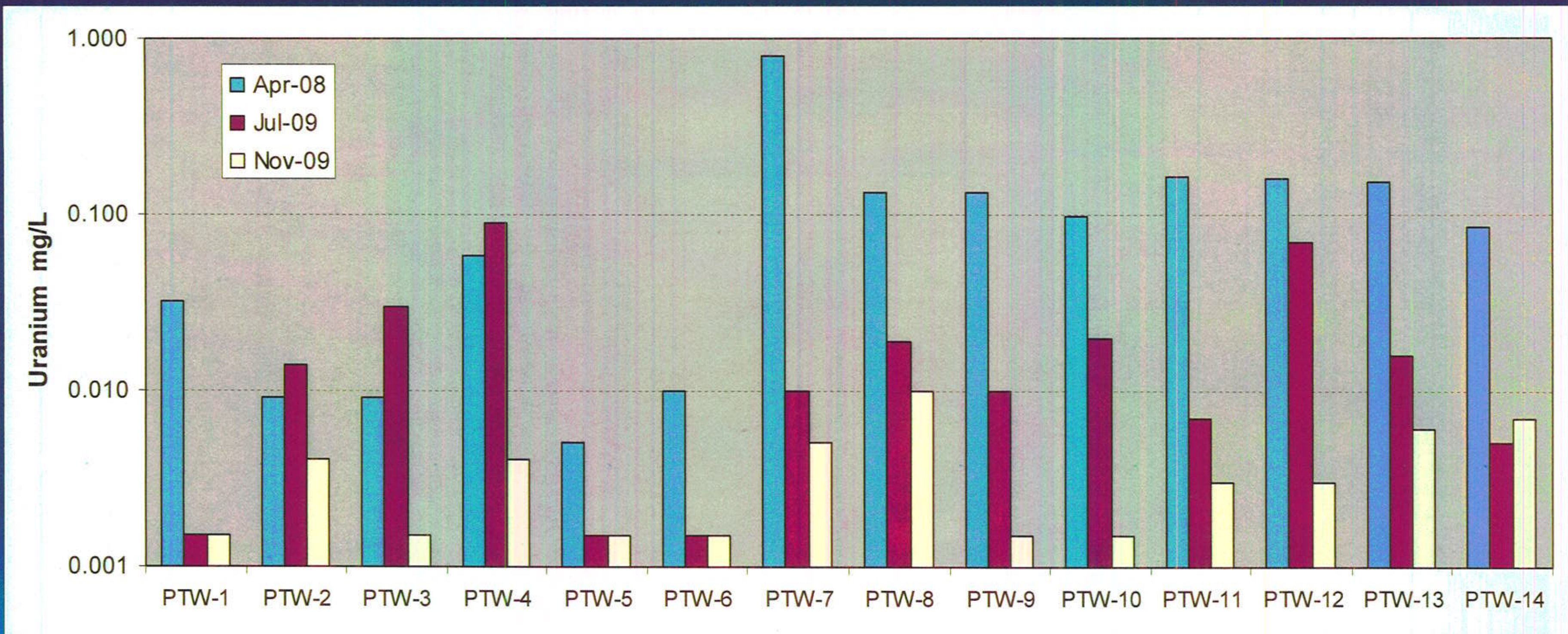


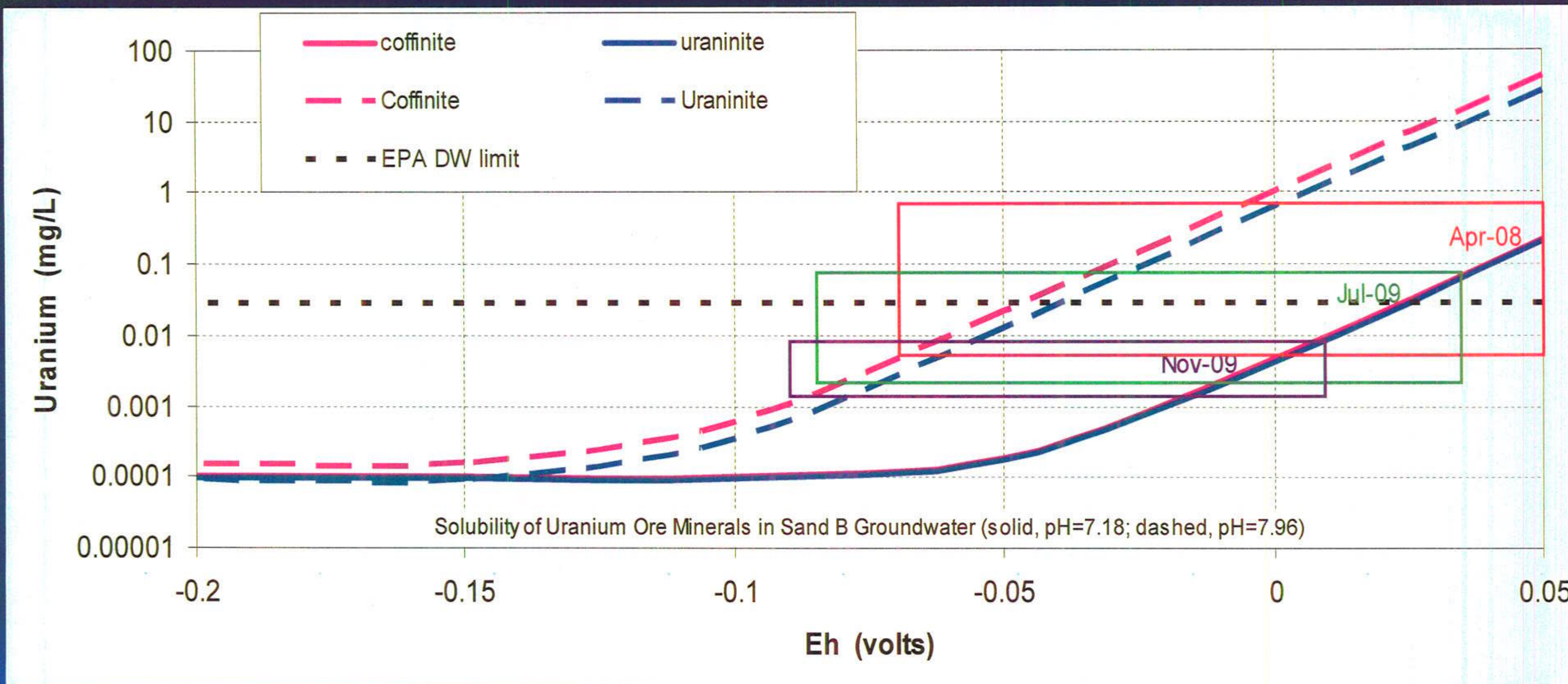
Goliad Production Test Wells Sand B

URANIUM:	Apr 2008:	0.005 to 0.804 mg/L
	July 2009:	<0.003 to 0.090 mg/L
	Nov 2009:	<0.003 to 0.010 mg/L



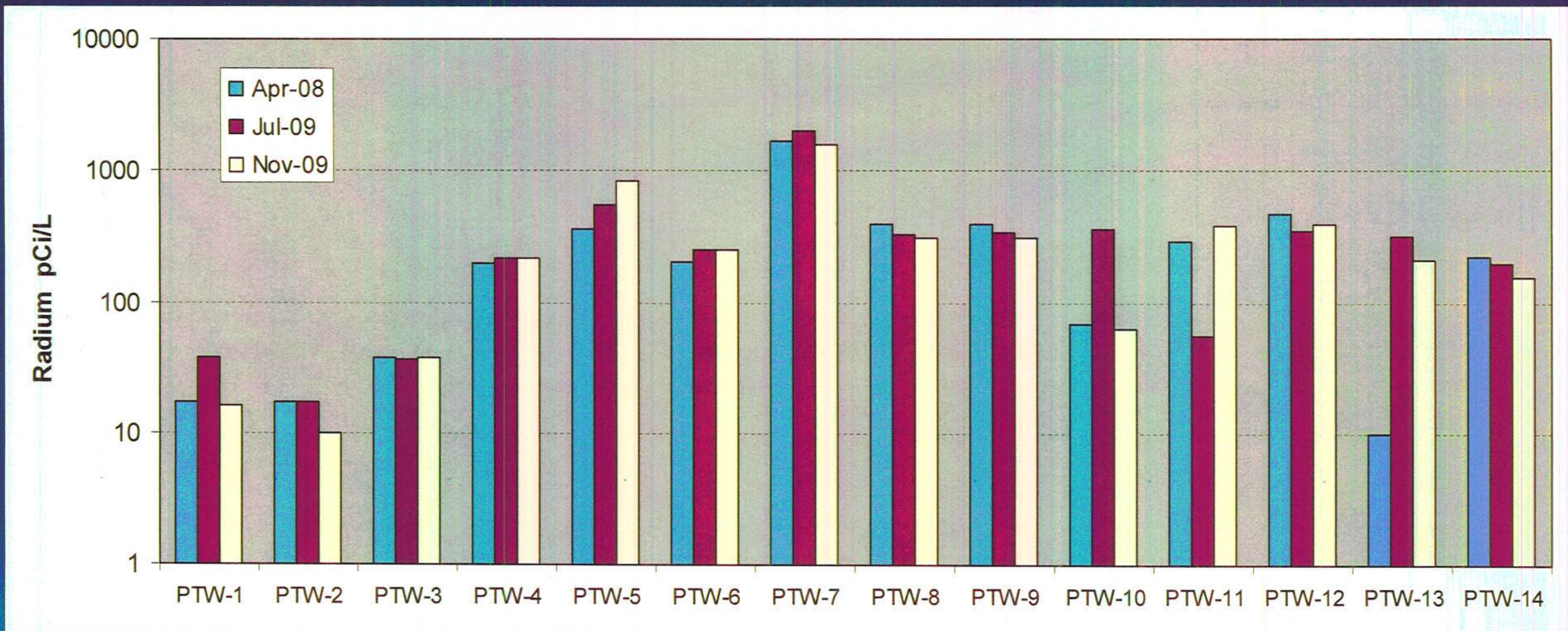
Uranium Energy Corporation (UEC), 2007, Goliad Project, Goliad County, TX, Application to Conduct In Situ Uranium Recovery.

Uranium solubility as a function of Eh



Production Test Wells (PTW), Sand B

RADIUM: Apr 2008: 10 to 1,680 pCi/L
July 2009: 17 to 2,000 pCi/L
Nov 2009: 10 to 1,590 pCi/L



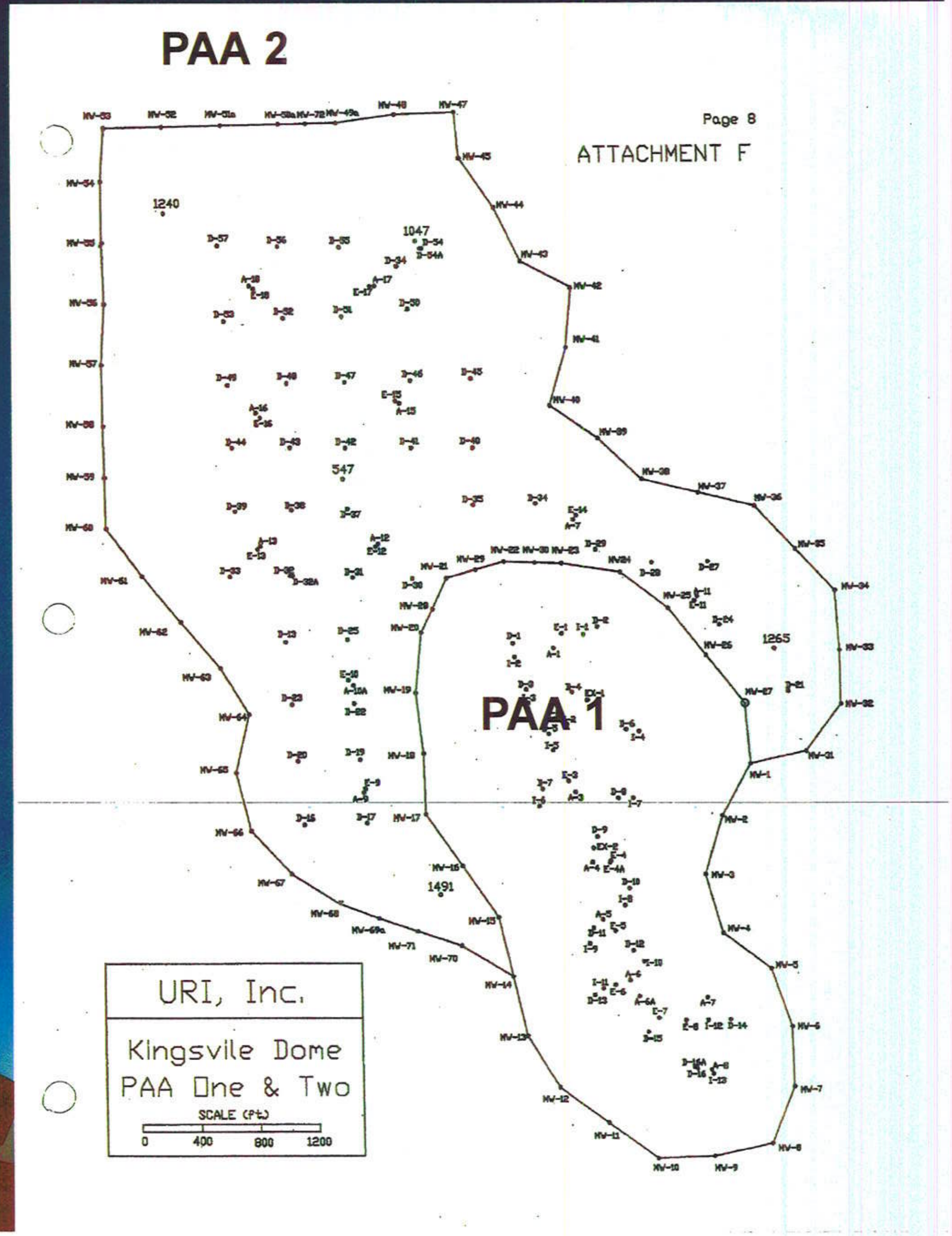
Uranium Energy Corporation (UEC), 2007, Goliad Project, Goliad County, TX, Application to Conduct In Situ Uranium Recovery.

Establish Baseline for the Entire Ore Body - Before Mining

PAA2 baseline established 2 years after mining began at PAA1

TCEQ Approval:
- PAA1: 12 April 1988
- PAA2: 28 June 1990

EPA (2011) recognizes that appropriate baseline is not recorded at many ISL sites



EPA (2011), Considerations Related to Post-Closure Monitoring of Uranium ISL/ISR Sites

2011 2nd Q Monitoring Results and TCEQ Restoration Values

	pH	Ec	U	Cl	Ca	HCO3	SO4	Mo	Ra-226
		umhos	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L
PAA1 well average	7.3	1715	**1.00**	175	**124**	**364**	**318**	**1.38**	**nr**
PAA1 Permit Value	**8.7**	**1717**	0.164	**234**	20.8	268	204	0.06	21.6
PAA2 well average	7.5	1382	0.86	166	**84**	**337**	**132**	**1.78**	**nr**
PAA2 Permit Value	**8.66**	**1662**	**1.89**	**224**	25.3	327	224	0.38	92
PAA3 well average	7.1	**2528**	**2.50**	220	**186**	**411**	**773**	**0.61**	**nr**
PAA3 Permit Value	**8.5**	2017	0.338	**289**	18.0	232	364	0.33	21.6

NOTE: Restoration values established with invalid statistical methods.

Excursions and Upper Control Limits

Wells in monitor well ring (MWR) are evenly spaced (400 feet); no consideration of sediment heterogeneity

No scientific or statistical basis for the values derived for upper control limits (maximum value, plus arbitrary factor)

Production zone wells are used to establish UCLs, rather than wells from MWR

Invalid methods allow legal pollution of groundwater

Monitor Wells spaced 400 feet apart do not capture preferential flow paths within fluvial sediments

Upper Control Limits for excursion monitoring are invalid

Maximum values in the Production Zone (PZ) are used to set upper control limits (UCL) at the Monitor Well Ring (MWR)

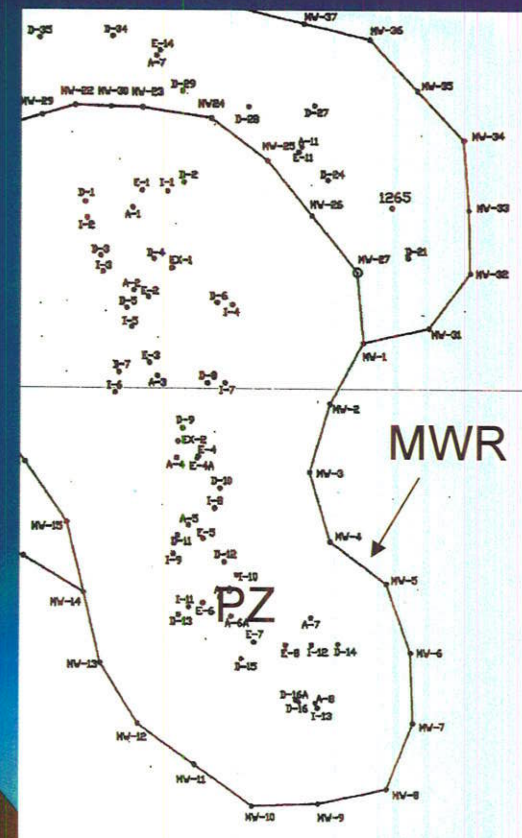
Chloride and Conductivity: max value + 25 percent

Uranium: max value + 5 mg/L

Uranium UCLs and average U at MWR:

	U UCL	Avg U at MWR
PAA1:	5.927 mg/L	0.057 mg/L
PAA2:	8.75 mg/L	0.019 mg/L
PAA3:	6.54 mg/L	0.023 mg/L

NOTE: This practice allows legal pollution of the groundwater outside the MWR!



Uranium values in Garcia Well W-24

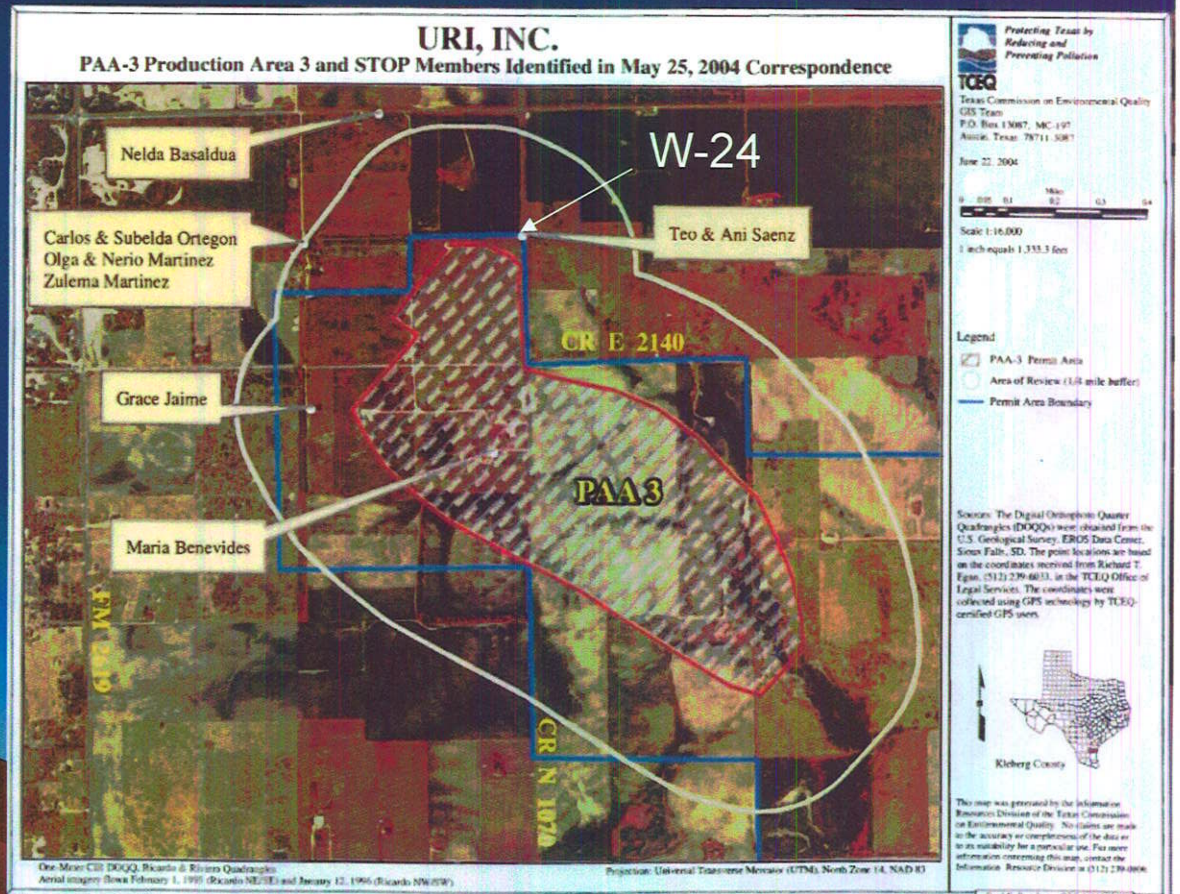
date	U (mg/L)	Data Source
6/18/98	0.152	EPA Region VI, 2004 investigation
9/19/00	0.187	EPA Region VI, 2004 investigation
Spring 2010	0.771	Texas A&M, Kingsville

PAA3 mined 1998 to mid 1999

No mining & no bleed mid 1999 - 2006

Excursions reported for north side of PAA3

2007, mining resumed



Restoration Values for Mining Zone

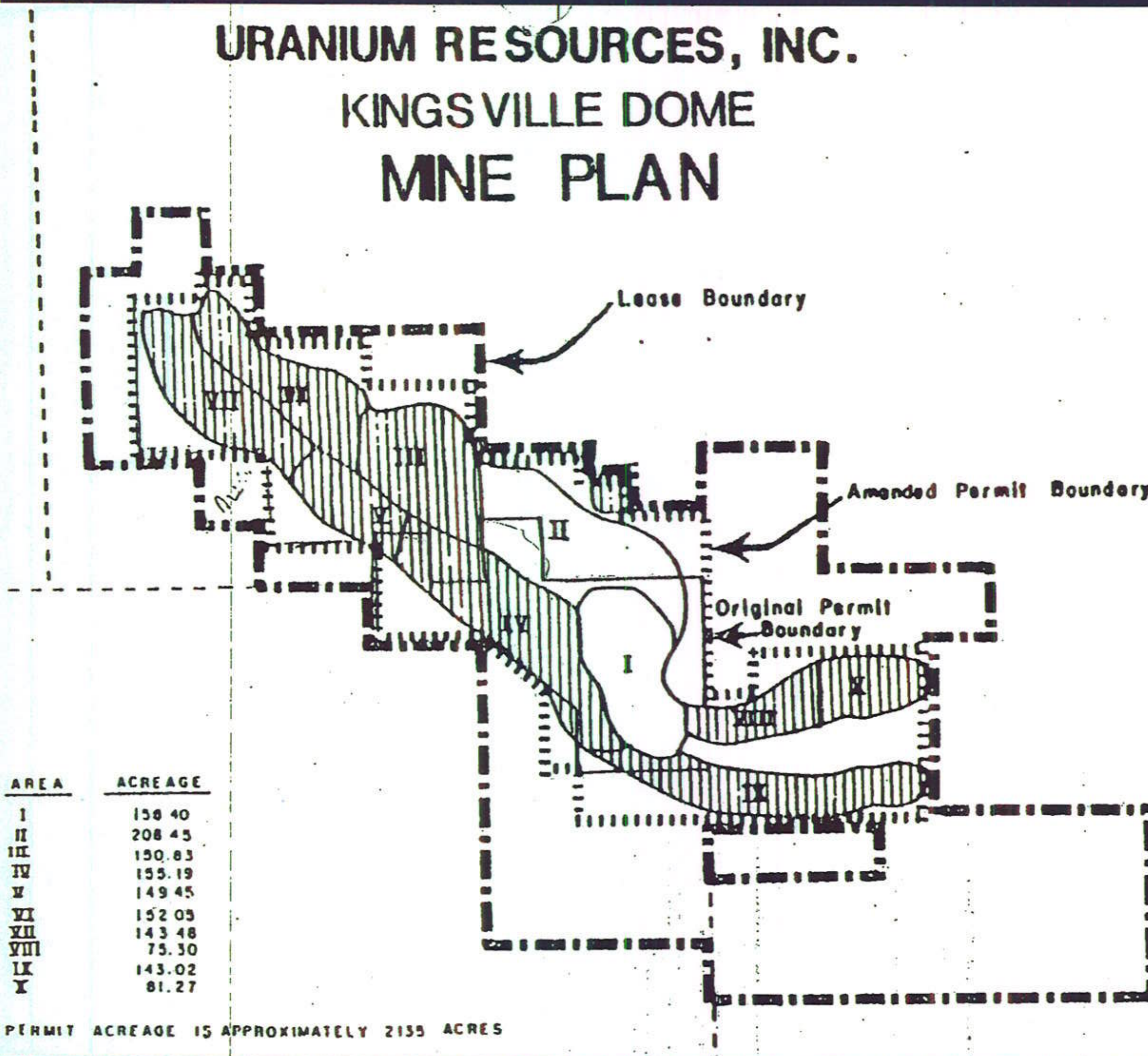
Establish early in the exploration process, after rough delineation of the ore body

Proper drilling and development (or geoprobe) of wells to minimize disturbance of ore

A minimum of 4 quarterly sample rounds for regional background locations (random or grid)

Valid statistical theory and methods to derive the numerical restoration standard for entire ore body

Delineation of the Ore Body



Initial Permit Dec 1986

PAA1 restoration values April 1988

PAA2 restoration values June 1990

PAA3 restoration values May 2006

Lagged approach for developing restoration values allows mining fluids in one PAA to bias adjacent PAA

2011 2nd Q Monitoring Results and TCEQ Restoration Values

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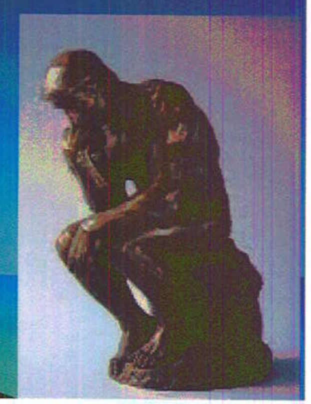
ISL Restoration in Texas is a Failure

‘Regarding the original question of whether or not groundwater has been restored to baseline in Texas uranium ISR well fields, it was observed that no well field for which final sample results were found in TCEQ records returned every element to baseline.’

USGS Open-File Report 2009-1143

If restoration is unsuccessful when invalid, biased baseline values are used, how can there be success when baseline values are derived with proper statistical theory and methods?



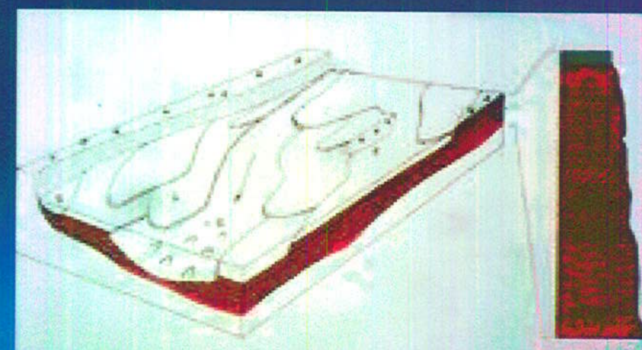
Long-Term Monitoring of ISL Sites

In its anticipated revisions of 40CFR192 to cover the ISL industry, EPA (2011) will consider long-term monitoring as part of the regulatory standards.

NRC license-established period is generally 6 months

Actual period to stabilize groundwater will be at least as long as the period of mining (several years)

Heterogeneous sediments – slow bleed from fine grain beds



EPA (2011), Considerations Related to Post-Closure Monitoring of Uranium ISL/ISR Sites

Long-Term Monitoring of ISL Sites

Responsible behavior
to protect human health
and the environment